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AUTHOR Fosburg, Linda B.; And Others
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ABSTRACT

This report summarizes findings of an evaluation of Head Start health services. Chapter one presents an overview of the background of the evaluation project. Chapter two highlights findings for the major evaluation questions. These questions focus specifically on children's health status prior to entry into Head Start, health services subsequently received, comparison of health services received by Head Start and non-Head Start children, and impact of services on the health status of children. Chapter three presents a detailed summary of findings for each of 10 health services mandated by Head Start performance standards. Mandated services include pediatric health, health history, and dental, anthropometric, nutrition, biochemical, developmental, speech and language, vision, and hearing evaluations. Appended are discussions of aspects of the evaluation methodology (including evaluation design, site selection, samples of children, health measures, and analytical methodology); a cross reference between findings presented in the executive summary and the main report; and a list of major contributors to the success of the 6-year evaluation. (RH)

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Abt Associates Inc.
55 Wheeler Street, Cambridge, Massachusetts 02138
Telephone • Area 617-492-7100
TWX: 710-3201382

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THE EFFECTS OF HEAD START HEALTH SERVICES:

EXECUTIVE SUMMARY OF THE HEAD START HEALTH EVALUATION

March 15, 1984

Project Director
Linda B. Fosburg, Ph.D.

Project Officer
Bernard Brown, Ph.D.

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TABLE OF CONTENTS

	Page
FOREWORD	v
CHAPTER ONE	
BACKGROUND OF THE HEAD START HEALTH EVALUATION	
Purposes of the Head Start Health Evaluation	1
Head Start Health Services	3
Experimental Design of the Evaluation	6
Summary of Remaining Chapters	8
CHAPTER TWO	
HIGHLIGHTS OF FINDINGS FOR MAJOR QUESTIONS	
What is the Health Status of the Children Prior to Their Entry into Head Start?	9
Accidents	9
Perinatal Health	9
Pediatric Health	9
Dental	10
Nutrition	10
Motor Development	10
Speech and Language	10
Vision	10
Hearing	11
What Health Services Did the Head Start Children Receive?	11
Medical Examinations	11
Dental Examinations	11

TABLE OF CONTENTS (Continued)

	Page
Nutrition	12
Blood Tests	12
Immunizations	12
Development Assessment	12
Speech and Language Examination	13
Vision Screening	13
Hearing Screen	13
Parent Involvement	13
Health Records and Reports	13
How Did Health Services Received Compare between the Head Start and Non-Head Start Children?	14
Medical Examination	14
Dental Examination	14
Nutrition	14
Speech Evaluation	14
Vision Screen	14
How Did Head Start Health Services Impact the Health Status of the Head Start Children?	15
Pediatric Evaluation	15
Dental Evaluation	16
Anthropometry	16
Nutrition	16
Biochemical Evaluation	17
Developmental Evaluation	17
Speech and Language Evaluation	18

TABLE OF CONTENTS (Continued)

Page

Vision Evaluation..... 18

Hearing Evaluation..... 18

CHAPTER THREE

DETAILED SUMMARY OF FINDINGS

Pediatric Health Evaluation and Health History..... 19

Dental Evaluation..... 21

Anthropometric Evaluation..... 22

Nutrition Evaluation..... 23

Biochemical Evaluation..... 25

Developmental Evaluation..... 26

Speech and Language Evaluation..... 27

Vision Evaluation..... 28

Hearing Evaluation..... 29

APPENDIX I

EVALUATION METHODOLOGY

Design of the Head Start Health Evaluation..... 31

Site Selection Considerations..... 33

Greene and Humphreys..... 38

St. Clair County..... 38

Maricopa County..... 39

Mingo County..... 40

Samples of Children..... 41

TABLE OF CONTENTS (Continued)

	Page
Health Measures	44
Pediatric Evaluation	49
Dental Evaluation	50
Anthropometric Evaluation	50
Hematologic Evaluation	50
Developmental Evaluation	50
Speech and Language Evaluation	51
Vision Evaluation	52
Hearing Evaluation	52
Family Background Interview	52
Health History	52
Dietary and Nutritional Habits Interview	53
Nutrition Observation	53
General Analytic Methodology	54
APPENDIX II	
REFERENCE GUIDE TO LOCATION OF FINDINGS IN HEAD START HEALTH EVALUATION REPORT	57
APPENDIX III	
ACKNOWLEDGEMENTS	67

FOREWORD

Head Start, a comprehensive program for children from low-income families, has mandated ensuring the physical well-being of children as one of means of ultimately maximizing children's learning experiences in school and fostering their overall development. Thus Head Start, since it inception in 1965, has provided a wide range of preventive and remedial health services, including periodic assessments of children's health status, prompt attention to factors which threaten to impair their growth, immunizations against infectious diseases, dental examinations and treatment, nutritional and mental health services, and health and nutrition education for parents and children. Some of these health services are provided directly by Head Start--for example, many programs conduct medical and dental examinations while most follow-up health services are provided through referrals to and coordination with other community agencies and health care professionals.

Although national assessments indicated that the overall health status of low-income children improved during the first decade of Head Start operations, they also indicated that many low-income children who were eligible for Head Start services remained at an elevated risk for health problems and required continuing health services. By 1975, the considerable experience Head Start had gained in addressing child health problems made it possible to further improve the program's health component by providing clearcut, standardized guidance to operating agencies about the precise health services to be performed. The Head Start Performance Standards (U. S. Department of Health, Education, and

Welfare, 1975) are detailed regulations for operating all components of the Head Start program, including the health services component.

The Head Start approach to improving the health status of the children and families it served was necessarily extensive, and designed to deliver the needed health services to children under a variety of local circumstances. As set forth in the Head Start Performance Standards, each Head Start agency was responsible for planning and carrying out an effective health services program for all enrolled children and their families. The Performance Standards mandated several general objectives:

- provision of comprehensive health services including medical, dental, mental health, and nutritional services to children;
- promotion of preventive health services; and
- inclusion of the child's parent in health care process though provision of necessary skills and insights to link family to ongoing health care system.

While Head Start has abundantly demonstrated its effectiveness in enhancing the cognitive and social skills of preschoolers, little has been known about the impacts of the Head Start's health component, that is, Head Start's medical, dental and nutritional services. Therefore, in 1977 the Administration for Children, Youth and Families, U.S. Department of Health and Human Services initiated a longitudinal study of the Head Start health services to assess the effectiveness of the health services being provided.

The evaluation employed a longitudinal experimental design, involving random assignment of children to a Head Start and a non-Head Start group and was conducted in four sites. The details

of the design of the Head Start Health Evaluation, samples of children recruited, the health measures used, descriptions of the sites and Head Start programs evaluated, and the statistical methods employed are described in Appendix I.

This report summarizes the findings of the evaluation of the Head Start health services. Chapter One presents an overview of the background of the evaluation. Chapter Two highlights the findings for the major evaluation questions. Chapter Three presents a detailed summary of findings for each of ten health services mandated by the Head Start Performance Standards. Appendix II provides a cross reference between the findings presented in the Executive Summary and the main report.

Appendix III lists the major contributors to the success of this six-year evaluation. We very much appreciate the dedication and hard work of the many people who together have made this study a success. They deserve special recognition for their contribution of time and effort to this evaluation.

Linda B. Fosburg, Ph.D.
Project Director
March 1984

CHAPTER ONE

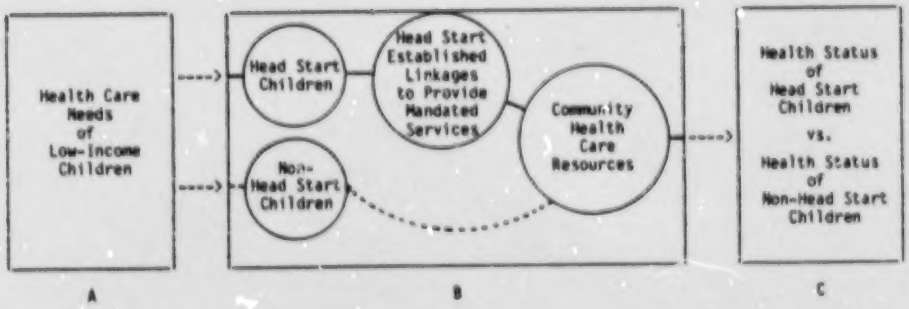
BACKGROUND OF THE HEAD START HEALTH EVALUATION

Purposes of the Head Start Health Evaluation

The major focus of the evaluation was to examine Head Start health services delivery system, how it responds to the health care needs of low-income children, and to what extent it produces improvements in the health status of the children served by the Head Start program. Exhibit 1-1 provides a schematic diagram which illustrates the major features of this system.

Exhibit 1-1

Head Start Health Services Delivery System:
The Linkage between the Health Care Needs and Health Status of Children through Utilization of Community Health Care Resources



Block A represents the health care needs of low-income children (and their families) who are eligible for participation in the Head Start program. Block B represents the community with the

Head Start health services delivery system as a linkage between the Head Start children (with their health needs) and the community health care resources. Block B also depicts the naturally occurring linkages between other low-income children (the non-Head Start children and their families) with community health care resources. Block C represents the impacts of the Head Start health services on health status of participating children and their families, compared to the health status of the non-Head Start children.

The Head Start Health Evaluation examines the Head Start health delivery system and addresses the following questions:

- What is the health status of the children prior to their entry in Head Start?
- What medical, dental and nutritional health services do Head Start children receive through Head Start?
- How do medical, dental and nutritional services received by Head Start children compare to those received by non-Head Start children?
- What are the impacts of Head Start health services on the health status of Head Start children?

By addressing these questions, the Head Start Health Evaluation makes several contributions. It provides confirmation of the previous research on the health status of low-income children and their health needs. The evaluation examines the Head Start program's health services, defined by the Head Start Performance Standards, as implemented in a variety of community contexts confronting Head Start programs. It also determines the extent of services similarly situated low-income children received in the absence of Head Start in the same communities and ascertains whether the implementation of the Head Start health services system ame-

liorated the health problems of participating children by providing screening, diagnosis, and follow-up treatment. Finally, the evaluation examines whether Head Start health services system had other desirable impacts such as promoting preventive care, linking children and their families with the community's health care systems and contributing to the optimal development of the child.

The rer inder of this chapter summarizes Head Start health services as mandated by the Performance Standards, provides a brief description of the experimental design of the evaluation, and introduces the communities and Head Start programs which participated in the Head Start Health Evaluation.

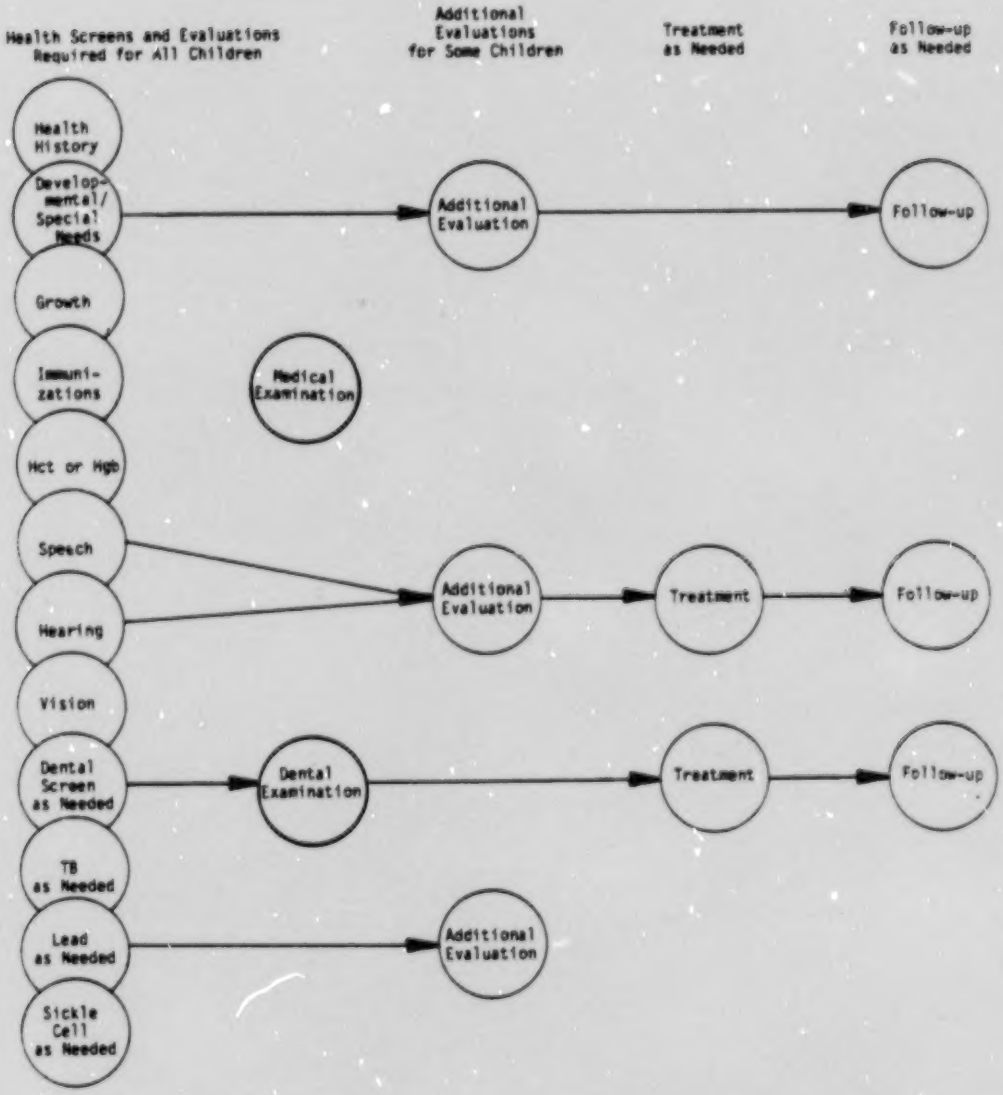
Head Start Health Services

Since its inception in 1965, Head Start has provided over 8.6 million low-income children with a comprehensive program of services. During the year 1980-1981, when the children involved in this evaluation were enrolled, 1,262 Head Start programs served a total enrollment of 387,300 children. Approximately one-third of the programs were located in each of the following types of communities: urban, rural, and a combination of urban and rural. The children served by these programs were mostly between the ages of three and five; only three percent of the children were younger or older.

The Head Start Performance Standards for the delivery of services mandate that each of the children enrolled in the program receive a full battery of health screens and examinations. Treatment and other follow-up are provided on an as-needed basis only. The services mandated and the processes for delivery of the health services are illustrated in Exhibit 1-2. According to the Program Information Records (PIR's) submitted to the Department of Health and Human Services, in 1980-1981, 85 percent of the enrolled chil-

Exhibit 1-2

Head Start Health Services:
The Process Mandated by the Performance Standards



dren received medical screening and 92 percent of those needing treatment received it; 78 percent of the children received dental examinations and 87 percent of those needing dental treatment received treatment; and 80 percent of the children completed all of their required immunizations.

To accomplish their mission in the delivery of health services, Head Start developed a staged system for the delivery of health services to participating children which, while addressing all of the mandated health services covered by the Performance Standards, recognizes that many negative health conditions affect only a small minority of the children in Head Start. The system can be summarized as follows: Head Start children are screened for all of the health conditions covered by the Performance Standards; these screens are regarded as preliminary indicators of health problems and those children with negative indications in any health area are referred to the appropriate medical or dental professional for further diagnostic work-up; only those children determined to be in need of treatment are referred for treatment to the appropriate service provider.

In addition to specifying the mandated health services the Performance Standards make recommendations about the type and level of personnel needed to perform the initial health screenings. To contain the costs of delivering services to children, the Performance Standards recommend that some of the screening activities can be performed by para-professional workers. These activities include the medical, dental and developmental health history (collection of medical records, immunization records, and teacher observations), growth assessment, and immunization status assessment. The Performance Standards are less specific about the personnel for the vision and hearing screens and indicate that these screens can be performed by a person trained to administer them to children. The "physical

examination" implies a physician's or nurse practitioner's judgment (the physician need not be a pediatrician). The dental examinations require a dentist or dental hygienist (under the supervision of a dentist). In sum, many levels of personnel, from para-professional to professional, may be required to conduct the initial health screens and examinations.

Exhibit 1-2 also illustrates one hypothetical example of the process followed in the delivery of health services to one Head Start child. First, a Head Start staff member obtains the child's health history and then the child receives all of the mandated health screens. Next, the child receives the required medical and dental examinations. In this example, the developmental screen yields suspicious results which require further diagnostic examination by a physician, who recommends no immediate treatment but specifies that additional follow-up will be required. The suspected hearing and speech problems are further evaluated by a speech pathologist who determines that while hearing is, in fact, normal, speech therapy and follow-up will be required. The dental examination finds large numbers of cavities which require two additional visits for restoration and follow-up. Finally, the suspicious lead value is followed by a more precise lead test which proves to be negative, requiring no further action. Thus for this child, the ten mandated health screens and examinations were followed by eight additional health services.

Experimental Design of the Evaluation

The Head Start Health Evaluation was designed to focus on the health status of Head Start children within the context of previous findings and to establish the linkages between the health status of Head Start participants and their participation in Head Start. The general design was to select a sample of Head Start

programs (to collect extensive data on program operations) and, within each program, to administer a coordinated battery of health measures to a scientific sample of participants.

The Head Start programs were selected with regard to those program characteristics that would presumptively be related to program performance. Previous research suggested health services for low-income families were likely to be strongly related to such variables as the urban or rural location of the families; the nature of the local health care system (for example, availability of free or subsidized health care); and the region of the country. Consequently these characteristics were applied to the selection of programs to evaluate.

Four Head Start programs, dispersed across four regions of the country, were selected. Half of the sites were predominately urban and the others were rural. (Although some areas in the "urban" sites were rural, the Head Start programs served children from urban locations in the county.) The counties were identified by the U. S. Public Health Service as "underserved" areas in terms of medical and dental services. The strength of the local health care system and the availability of free or subsidized health care for low-income children varied greatly and was an important factor in the delivery and impact of health services on the health status of the children. These issues are highlighted in the descriptions of the Head Start programs included in Appendix I.

Within each of four sites, 200 to 300 children who were eligible to enter Head Start in the fall of 1980 were recruited for the evaluation. These children were divided into groups based on age and sex then randomly assigned to the Head Start or non-Head Start group. A pretest evaluation of the health status of half of each group of children was administered in the spring of 1980, prior to the Head Start group's entry into the program. The posttest of

the evaluation, conducted one year later, evaluated the health status of all children in both groups after the Head Start group had nearly completed one year in the program.

Many children recruited for the pretest dropped out of the evaluation. Hence, prior to the posttest, additional children were recruited. The Head Start recruits were first year Head Start participants and the non-Head Start recruits were other similar-aged, low-income children. The major consequence is the distinction between (1) the impacts of Head Start determined by evaluation of the children who received both the pretest and the posttest (longitudinal impacts) and (2) the impacts of Head Start determined by evaluation of all of the children who received the posttest evaluation (cross-sectional impacts or impacts on the total posttest sample). Appendix I provides additional details on the design of the evaluation, the samples of children recruited and the health measures administered.

Summary of Remaining Chapters

Chapter Two highlights the answers to each of the four research questions regarding the health status of the children prior to Head Start entry, the health services received by the Head Start children, a comparison of health received by the Head Start and the non-Head Start children, and the impacts of health services on the health status of the children. Chapter Three provides more detailed findings of the evaluation results for each of the ten areas of health services mandated by the Performance Standards: pediatric health, health history, dental, anthropometric, nutrition, biochemical, developmental, speech and language, vision, and hearing.

CHAPTER TWO

HIGHLIGHTS OF FINDINGS FOR MAJOR QUESTIONS

What Is the Health Status of the Children Prior to Their Entry into Head Start?

Many of the children present a number of health problems which are remediable and require the attention of health care professionals. The following findings are drawn from the pretest of the evaluation. All of the children evaluated were eligible for enrollment into Head Start.

Accidents

Serious accidents were reported to have occurred to 35 percent of the children, including burns (5%) and swallowing poisonous substances (9%).

Perinatal Health

Ten percent of the children had low birth weight, 14 percent had gestation periods of less than 38 weeks or more than 42 weeks and 34 percent had health problems at birth. Some 31 percent of the mothers did not have a prenatal health visit in their first trimester, 34 percent had health problems during their pregnancy and 35 percent had large body weight changes during pregnancy (either increases or decreases.) Twenty percent of the mothers were under 18, as opposed to the national average of six percent.

Pediatric Health

The pediatric examination determined that 53 percent of children eligible to enter Head Start were found to have at least

one pedatric problem; 9 percent had middle ear infections; 8 percent had allergies; 7 percent of the children over 4 years of age suffered from eneuresis; 6 percent had asthma; 5 percent had skin problems; 3 percent had psychosocial problems; and 2 percent had urinary infections.

Dental

On the average, a child entering Head Start had 4.6 cavities (decayed surfaces), 0.6 fillings and 0.08 missing teeth. One out of four children urgently needed dental care.

Nutrition

Children entering Head Start had adequate diets for protein, vitamins A, B_{12} C, thiamin, and riboflavin. In general, calcium and iron intakes were marginal, however. In some locations magnesium, phosphorus, niacin and vitamin B_6 and total caloric intake were also marginal.

Motor Development

At pretest, 34 percent of the children entering Head Start scored below the tenth percentile for fine and gross motor skills expected of children of the same age.

Speech and Language

Sixty-three percent of the children at pretest had indications of a speech or language problem. Nearly 90 percent of these children with articulation delays were more than one year behind.

Vision

Sixty-one percent of the children had one or more vision deficiencies.

Hearing

At pretest one out of three children failed the hearing test. Fourteen percent had otitis media.

What Health Services Did the Head Start Children Receive?

Most Head Start children received at least some of the mandated health services; however there were many gaps in coverage. The following findings are drawn from the posttest of the evaluation. The sources of information on Head Start Health Services include: Head Start health records, mother's or principal caretaker's reports, and Head Start Program Information Reports.

Medical Examinations

According to Head Start health records, over 85 percent of the children received a medical examination either immediately prior to or during their first year in Head Start. Of those children examined, 24 percent were found to have medical problems and 56 percent of those with medical problems were treated.

Dental Examinations

For the Head Start children studied, 80 percent received dental examinations. Fifty percent of the children were found to have dental problems. Of those children found to have dental problems, 68 percent were treated.

One of the Head Start programs was unable to arrange for adequate dental services. There, ninety-four percent of the children had decayed teeth at posttest. These cavities were increasing at rate of six per year resulting in an average of 11 cavities per child. Less than 1 percent of the cavities had been filled during the program year.

Nutrition

Head Start children received meals and snacks that provided mandated proportions of children's daily nutrient needs, accounting for up to 50 percent of children's total daily intake. This is particularly important, given the marginal vitamin and mineral intakes of some of the nutrients that were observed in the non-Head Start group. Head Start placed families in need of food assistance in touch with appropriate persons or agencies. Fifty-seven percent of Head Start families were receiving benefits at posttest that they were not receiving at pretest. Families of Head Start children served meals at home that were superior to those served by non-Head Start families in nutritional quality for several nutrients. Program health records show 45 percent of the Head Start children received nutritional assessments.

Blood Tests

For the Head Start children studied, program records showed that 67 percent received blood tests.

Immunizations

For the Head Start children studied, 77 percent were immunized. Thirty-four percent of the children who had been immunized prior to entering Head Start and over 49 percent of all Head Start children were immunized through Head Start during the program year.

Development Assessment

Head Start records show 40 percent of Head Start children received developmental assessments. Of those found to have a problem, one-third received services.

Speech and Language Examination

Thirty-four percent of Head Start children studied received a speech screen. Of those suspected to have a speech problem, 30 percent received a formal speech examination. Followup services were received by 77 percent of the children determined to be in need of speech therapy.

Vision Screening

Fifty-four percent of the Head Start children received a vision screen. Only 31 percent of the children needing follow-up and treatment received it.

Hearing Screen

For the Head Start children studied, 61 percent received a hearing screen. Eighty-two percent of children found to have a hearing or ear infection problem were referred for treatment.

Parent Involvement

Approximately 85 percent of the parents visited a Head Start classroom at least once. On the average, parents visited Head Start classrooms once a week. Of all Head Start parents, 31 percent attended a meeting on food and nutrition.

Health Records and Reports

In the Head Start sample, medical treatment received for children with medical findings was 41 percent below that reported in the Program Information Reports (PIR) (56% vs. 97%). The percentage of children with identified dental problems receiving treatment were 31 percent below those reported in the PIR (68% vs. 99%).

How Did Health Services Received Compare between the Head Start and Non-Head Start Children?

Head Start children were much more likely to receive preventive and remedial health services than other low-income children in their community. The following findings are drawn from the posttest of the evaluation.

Medical Examination

Head Start children were more likely to receive a medical examination than non-Head Start children (86% vs. 68%). More Head Start children received additional preventive health services such as TB tests (67% vs. 42%) and lead tests (15% vs. 8%).

All pediatric problems found during the pretest evaluation were formally communicated to the local Head Start program and to the parent and local physican of the child. Treatment for those pediatric health problems was more likely to be received by Head Start children (46% vs. 36%) and there were likely to be fewer problems (43% vs. 66%) at posttest. Although Head Start children with a single medical problem were more likely to be treated for the problem (44% vs. 22%), Head Start children with multiple medical problems were equally likely to be treated (46% vs. 42%).

Dental Examination

More Head Start children received dental examination (80% vs. 27%). In half of the sites, Head Start children had significantly less dental plaque. As a result of receiving more services, Head Start children were more likely to have fillings (29% vs. 11%). Head Start children were also more likely to have gone to a dentist with their families and were more likely to make such visits regularly.

Nutrition

Head Start families served meals at home that were richer in nutrient quality than non-Head Start families; for example, in the levels of vitamins A and C. Head Start children present in the center consumed appreciably more calories and protein as well as calcium, magnesium, phosphorus, vitamin A, riboflavin, and vitamin B_{12} than Head Start children absent from the center or non-Head Start children.

Speech Evaluation

Many more Head Start children received a speech screen or evaluation (34% vs. 15%). The Head Start children were more likely to receive speech therapy services (77% vs. 0%).

Vision Screen

More Head Start children were likely to receive vision screen or examination (54% vs. 9%). For Head Start children, the examinations were likely to be provided by Head Start staff.

How Did Head Start Health Services Impact the Health Status of the Head Start Children?

Significantly, when the mandated health services were delivered to Head Start children, their health status was substantially improved. The following findings are drawn from both the pretest and the posttest of the evaluation. The sources of information on Head Start health impacts include: mother's or principal caretaker's reports, and results of both the pretest and the posttest evaluation teams' findings.

Pediatric Evaluation

Head Start children, found to have pediatric problems at the pretest, were less likely to have the same problems remaining at

posttest than non-Head Start children (43% vs. 66%). This finding was especially significant in one medically underserved site. Without Head Start services, children were much less likely to receive treatment for known medical problems.

Dental Evaluation

In one site, Head Start provided dental examinations to 100 percent of the children, and treated those needing dental services; Head Start children received significantly more fillings of decayed surfaces (4.8 filled surfaces/child vs. 0.06 filled surfaces/child). Head Start children had significantly less plaque on their teeth compared to non-Head Start children in two sites; both sites had flouridated water supplies. In the other two sites with predominately unfluoridated water supplies, both Head Start and non-Head Start had higher and similar levels of plaque. The Head Start children in the latter two sites also had between 178% and 489% more cavities than the Head Start children in the site providing a high level of dental services.

Anthropometry

Significant differences in anthropometric measures were not found.

Nutrition

The nutritional intake evaluation showed the exceptionally positive impacts of Head Start's nutrition services. The Head Start children took in significantly more calories, protein and almost all of the other nutrient studied compared to the non-Head Start children. Head Start children consumed significantly more calcium, magnesium, phosphorus, riboflavin, vitamin A and vitamin B_{12} at posttest compared to pretest. Non-Head Start children and Head

Start children who were absent from Head Start when their nutritional intake was evaluated did not show these gains in nutrient intake. Families in Head Start were more likely than non-Head Start families to secure food assistance using WIC or WIC plus food stamps (57% vs. 33%).

Biochemical Evaluation

For blood beta-carotene levels, a measure of recent vitamin A intakes, Head Start children had higher levels than the non-Head Start children. In the total posttest sample, 14 percent of the Head Start children had low levels while 24 percent of the non-Head Start children had low levels of beta-carotene. In a substudy of one site, Head Start children also had significantly higher vitamin C levels. Although there was almost no iron deficiency, Head Start children who received a hemotologic screen from the program were less likely to have abnormal hemoglobin or hematocrit levels at posttest. There were no significant differences between the Head Start and non-Head Start children in blood levels for hematocrit, hemoglobin, FEP, MCHC, TIBC, serum iron, transferrin saturation, or ferritin.

Developmental Evaluation

At posttest Head Start children were more likely to have no problems identified by the battery of measures used in the developmental evaluation of the children (55% vs. 45%). Longitudinal Head Start impacts on children's motor coordination and development were significant for children in one site with a full-time, five-day program. There was also evidence that Head Start had a significant impact on children who performed below the 20th percentile on the McCarthy Scale of Motor Development at pretest. By posttest, 19 percent fewer Head Start children performed below the 20th percentile compared with 4 percent fewer non-Head Start children.

Speech and Language Evaluation

Head Start had positive impact on children with speech and language comprehension problems. Head Start children tested at both pretest and posttest were less likely to have speech and language deficiencies at posttest (38% vs. 52%). There was also evidence at posttest of Head Start's effects on children's speech and language comprehension performance which was related to Head Start's delivery of services. In one site where Head Start program staff had received special speech training, Head Start children had significantly fewer articulation and language comprehension problems.

Vision Evaluation

Fewer Head Start children than non-Head Start children who were evaluated at both pretest and posttest had a vision deficiency at posttest. This trend, although not significant, was consistent across all sites. Otherwise there were no significant differences on the vision evaluation measures.

Hearing Evaluation

For otitis media, the prevalence was 13 percent for the Head Start children and 11 percent for the non-Head Start children There were no significant differences between the two groups of children on any of the other hearing evaluation measures.

CHAPTER THREE

DETAILED SUMMARY OF FINDINGS

Pediatric Health Evaluation and Health History

In the pediatric health evaluation a board-certified pediatrician examined each of the children. The evaluation protocol was adapted from that used by the National Center for Health Statistics in the First National Health and Nutrition Examination Survey and was designed to classify the children's health problems. In addition, each child's mother or guardian was interviewed to obtain a health history. Data from the pediatrician's examination and health history were synthesized and coded into specific health problems, such as otitis media, allergies and pica.

The prevalence of health problems (as defined in this evaluation) among low-income children at pretest was lower than found in earlier national studies of equivalent populations. Fifty-three percent of the children had health problems. The most prevalent problems were:

- allergies;
- asthma;
- dermatologic problems,
- enuresis;
- otitis media;
- pica; and
- surgical problems.

However, prevalence of problems was higher in two sites where access to medical care was difficult for this population.

In addition, the perinatal health history of the mother was analyzed. Pregnancy risk factors included:

- first prenatal visit after the first trimester of pregnancy,
- mother's report of health problems during pregnancy;
- weight loss or gain of more than 30 pounds; and
- mother's age at child's birth less than 18.

Approximately one-third of the mothers reported each of the first three maternal health indicators above. One out of five children were born to mothers who were less than 18 years of age--more than three times higher than the national average.

Head Start's involvement in the delivery of the following medical services was examined:

- medical examination just prior to or during Head Start year,
- presence of a health record on the child (including a health history); and
- documentation of immunization status.

Overall, 85 percent or the Head Start children had received a physical examination and 77 percent had a immunization record. Sixty-seven percent of the children had received a TB test. In St. Clair County, a mostly urban area with many older buildings, two out of three children were tested for lead poisoning from lead-based paint and other sources.

In the longitudinal sample, proportionately fewer Head Start than non-Head Start children who had health problems at pretest continued to have problems at posttest. The positive impacts of Head Start's health services on children were particularly evident in locations where access to services is difficult.

Although there were no differences between groups in the receipt of treatment for illness in the past year, Head Start children were more likely to have received a physical examination and other preventive health services (e.g., TB test, lead test, and immunizations) than children in the non-Head Start group.

Dental Evaluation

Each child received a dental examination by a pedodontist who charted carious lesions on each surface, the number of missing and filled teeth, evidence of gingival inflammation, and occlusion abnormalities. Each mother or primary caretaker was interviewed to obtain a dental history. The examinations and dental histories, coupled with a review of Head Start health records of provision of services, were used to assess the impact of the Head Start program's dental education and services.

The dental health of children in the Head Start Health Evaluation was notably poorer than that of equivalent participants in the Ten-State Nutrition Survey and the First National Health and Nutrition Examination Survey. At pretest, over half of the children had decayed surfaces, and less than 10 percent had any filled teeth. Prevalence of dental problems was highest in 2 out of 4 sites where dental services were scarce and the community water system was not fluoridated. (Fluoride is a known inhibitor of caries development.)

Eight out of ten children enrolled in Head Start received a dental examination and 82 percent of those diagnosed as having dental problems were referred for follow-up services or received treatment. There is strong evidence to suggest that some Head Start procedures for delivering dental services are more effective than others. The one site that examined all Head Start children purchased services on a contractual basis from the local health department. This health department moved a dental clinic in a mobile trailer from site to site, frequently to the parking lot of the Head

Start center. In contrast, two other sites examined about 65 percent percent of the Head Start children in the evaluation. Both of these sites had few dental examination resources available and had to make special arrangements with providers for dental examinations. Children absent from Head Start on examination day usually did not receive one.

Posttest comparisons of the dental health of Head Start and non-Head Start children indicated that systematic provision of Head Start dental services leads to substantial improvements in the dental health of the Head Start children. This is particularly true in one site where the Head Start children received significantly more fillings between pretest and posttest and had a lower prevalence of decayed and missing teeth at posttest. In general, Head Start children were more likely to brush their teeth once-a-day and maintained better hygiene practices than children in the non-Head Start group.

Anthropometric Evaluation

To provide another estimate of the overall well-being of the children, the data collection teams measured height, weight, arm circumference, and triceps skinfold thickness. These anthropometric measurements were compared with reference data from the National Health and Nutrition Examination Survey to obtain age- and gender-specific percentiles expressing the ranking of a child relative to a healthy national reference population of the same age and sex.

According to the pretest evaluation, median height percentiles for children were below the national reference medians. The weight percentiles more closely approximated the national average. Although the younger children in the pretest tended to be below national norms, the posttest evaluation indicated that after age four, the children's average height and weight was nearly at the

50th percentile. Except in one site with a larger proportion of Hispanic children, fewer children were below the 10th height and weight percentiles than found nationally.

In general, the growth status of the Head Start and non-Head Start groups of children was typical of most children in the United States. Given two groups of children with normal growth status, there were few indications of a Head Start impact on that status.

Nutrition Evaluation

The nutrition evaluation focused on the adequacy and quality of the diets consumed by Head Start and non-Head Start children. Information was collected on all foods and beverages consumed by each child in a complete 24-hour period. These data were obtained primarily from each child's mother or principal caregiver. At posttest, direct observations were used to gather information on the foods children received while attending Head Start. The total nutrient content of each child's diet was calculated. The relative quality of children's diets was further assessed through measurement of nutrient density, that is, the amount of the nutrients provided in the diet relative to the total number of calories provided. The 24-hour nutrient totals were subdivided to reflect the nutrient content and nutritional quality of foods provided to the child at home and those provided through Head Start.

The children examined at pretest presented nutritional problems similar to those noted in the Ten State Nutrition Survey and the First Health and Nutrition Examination Survey. The most problematic nutrients were iron and calcium. The average iron intake was below the recommended amount in all four sites; the average calcium intake was below standard in three sites. Total caloric intake was also marginal in two sites.

Posttest analyses examined three groups of children: Head

Start children who were present at the Head Start center on the day nutrition information was collected (and had received meals and snacks provided by Head Start), Head Start children who had been absent on the day nutrition information was collected (and therefore had not received Head Start meals and snacks), and non-Head Start children. These analyses revealed that the nutrition component of the Head Start program has a significant and positive effect on the children who received the meals and snacks at the Head Start centers. Positive effects were evident in all four sites; the smallest effects were noted in Maricopa County, where the Head Start nutrition program served fewer meal and snacks than were served in other programs. As a group, the Head Start children who had received the Head Start meals and snacks, had virtually no problems of inadequate or marginal nutrient intake. In contrast, non-Head Start children and the Head Start children who had not received the meals and snacks from Head Start had many more nutrient intake problems. Most profound among these were marginal intakes of both calcium and iron.

Significant Head Start effects were also noted among the children examined at both pretest and posttest. Across all sites, children who had received meals and snacks from Head Start showed pretest to posttest improvement in average intakes of calcium, magnesium, phosphorus, vitamin A, riboflavin and vitamin B_{12}. Non-Head Start children and Head Start children who had not received meals at Head Start, on the other hand, showed no significant improvement in average nutrient intake from pretest to postest. Additionally, the proportion of individual children who recieved less than 100 percent of the recommended intake for any nutrient was substantially decreased (from pretest to posttest) in the group of children who were present at Head Start. These improvements were far less prevalent in the non-Head Start and Head Start-absent groups.

There is strong evidence that the goals and objectives of the Head Start nutrition service program are being successfully achieved. Meals and snacks are nutritionally adequate, balanced and provide 40 to 50 percent of the children's daily nutrient intakes. In contrast, non-Head Start children and Head Start children not attending a center are at risk of consuming an inadequate or marginal diet. The meal service component of the Head Start nutrition program served meals and snacks that successfully provided the mandated proportions of children's average daily nutrient needs (one-third of the RDA for part-day programs; one-half to two-thirds of the RDA for full-day programs).

Significant differences between Head Start and non-Head Start families in the pattern of participation in food assistance programs from pretest to posttest suggest that Head Start may play an important role as facilitator, by putting families in need of food assistance benefits in touch with appropriate persons or agencies. Reported parent education meetings focusing on food and nutrition reached 31 percent of the parents. Nonetheless, the nutritional quality of diets provided to Head Start children at home was superior to that of non-Head Start children in concentration of vitamins A and C and cholesterol and to a lesser extent, the amount of fat and carbohydrate consumed.

Biochemical Evaluation

A blood sample was drawn from 816 children between the ages of 1.8 and 6.6 years. Biochemical analyses focused on an extensive assessment of iron status (including determination of hemoglobin, free erythrocyte protoporphyrin, total iron binding capacity, serum iron, transferrin saturation, and serum ferritin concentrations); an evaluation of vitamin A and vitamin C status; and a determination of serum cholesterol levels.

Compared with findings of the Preschool Nutrition Survey, conducted a decade ago, prevalence at pretest of abnormal hematocrit, serum iron, and transferrin saturation levels were similar. However, a much smaller percentage of the children in this study had abnormal hemoglobin, TIBC, or vitamin A levels. And a much higher proportion of black and Hispanic children in the Head Start Health Evaluation had unacceptably high cholesterol values than was found in the Preschool Nutrition Survey.

At posttest, there was evidence of Head Start impacts on the children from several perspectives. Sixty-seven percent of the Head Start children received a hematologic screening (hematocrit and/or hemoglobin reading) conducted by the program. This is particularly important since there is little evidence that children receive these screens through any source other than Head Start. Second, significantly fewer children screened by Head Start had abnormal hematocrit level or hemoglobin concentrations at posttest (7% vs. 18%). The children with abnormal values at posttest were also more likely to be receiving Food Stamps and/or WIC program benefits, suggesting these programs were well-targeted to children in need. Another significant Head Start impact and reflective of the more nutritional dietary intakes of the Head Start children were the children's serum beta carotene levels. This biochemical measure is an indicator of recent intake of Vitamin A. Iron status and serum cholesterol levels of the two groups were not significantly different.

Developmental Evaluation

The developmental assessment of the Head Start Health Evaluation examined four aspects of the children's development: the children's performance on the Motor Scale of the McCarthy Scales of Children's Abilities; the child's willingness to cooperate with the developmental tester; the parent's report of whether the child

behaved in ways which are associated with being overly withdrawn; and the parent's report of whether the child behaved in ways which are associated with being overly aggressive. In addition, data were abstracted from Head Start health records about developmental services (screens, problems identified, and referrals for or treatment of problems) provided to Head Start children.

Pretest results show that 66 percent of the children had some evidence of a development problem on one or more of the four indices. Forty-one percent of the Head Start children were screened for developmental problems. Only one-third of the children who were found to have problems received treatment for those problems.

Head Start has a significant impact on children's motor coordination and development, especially for those children who perform below average on the McCarthy Motor Scale. The impact of Head Start on the children's motor coordination and development was strongest in the site which had the most intensive program, a full-time, five day program. Significant effects were not found in the other sites which have part-day and/or part-week programs. Although Head Start children showed a trend of fewer developmental problems than non-Head Start children, these differences were statistically significant only in one site.

Speech and Language Evaluation

This evaluation included a speech and language comprehension component to identify children with deficiencies in these areas and to determine whether participation in Head Start is associated with remediation of such problems. The speech and language evaluation consisted of the four language comprehensive scales from the Assessment of Children's Language Comprehension (ACLC), the Denver Articulation Screening Examination (DASE), the sentence repetition subtest of the Fluharty Preschool Speech and Language Screening Test, and

selected items from the Physician's Developmental Quick Screen for Speech Disorders (PDQ). These tests were administered to all children by a speech pathologist from the local area. Information about speech services was obtained from Head Start programs and from interviews with parents.

At pretest sixty-three percent of the children failed to achieve expected levels of speech and language comprehension. Articulation delays appeared to be more severe than language comprehension delays. Ninety percent of those with articulation problems were at least one year behind.

Head Start records indicate that 34 percent of Head Start children were screened for speech and language problems. Children whose mothers suspected problems or who had medical insurance were more likely to be screened.

There have been numerous studies of Head Start's impacts on language achievement in children. However, few studies of Head Start have focused on communication disorders evaluated by speech pathologists, the methodology employed in the Head Start Health Evaluation. According to the results of this evaluation, there was only modest evidence of Head Start impacts on amelioration of problems in children's speech and language comprehension. Head Start children in one site where Head Start operates a full-time, five-day program, scored significantly higher in language comprehension, and Head Start children in another site, where Head Start staff had received special speech training, had significantly higher articulation scores and fewer speech problems.

Vision Evaluation

The vision evaluation was administered by an optometrist using the modified clinical technique. It consisted of a battery of tests that measured visual acuity, stereopsis, ocularmotility,

binocularity, color discrimination, strabismus, convergence, and the need for lens correction.

Prevalence of vision deficiencies at pretest were 4 percent for visual acuity and 9 percent for strabismus. From among the evaluation's extensive range of vision measures, 61 percent of the children at pretest failed one or more of the measures.

Head Start children were much more likely to have ever been screened for vision deficiencies than children in the non-Head Start group. Head Start children received significantly more vision examinations, usually through the Head Start program. Although such examinations could lead to earlier detection and more effective treatment of vision problems than if first examinations occur later in life, there was no indication that Head Start children had fewer vision problems than children not in Head Start. There also was little indication that Head Start provides more vision services to children or that the program has an impact on Head Start families' use of vision services.

Hearing Evaluation

The hearing evaluation consisted of two parts: testing for hearing threshold levels at each of several frequencies and tympanometric testing for middle-ear impedance. The examination was conducted by audiologists.

Approximately 11 percent of the children at posttest had hearing problems or chronic ear infections (serous or recurrent otitis media). A much higher prevalence rate was found at pretest but the pretest data may simply indicate that the children examined were too young for an accurate hearing evaluation.

Two-thirds of the Head Start children received a hearing screen. Head Start referred 82 percent of children diagnosed to have deficiencies for treatment. In two sites, Head Start was more

likely to screen for hearing deficiencies if the child's mother reported a history of ear infections. There were no differences in the hearing status of Head Start and non-Head Start children at posttest that could be attributed to program intervention.

APPENDIX I

EVALUATION METHODOLOGY

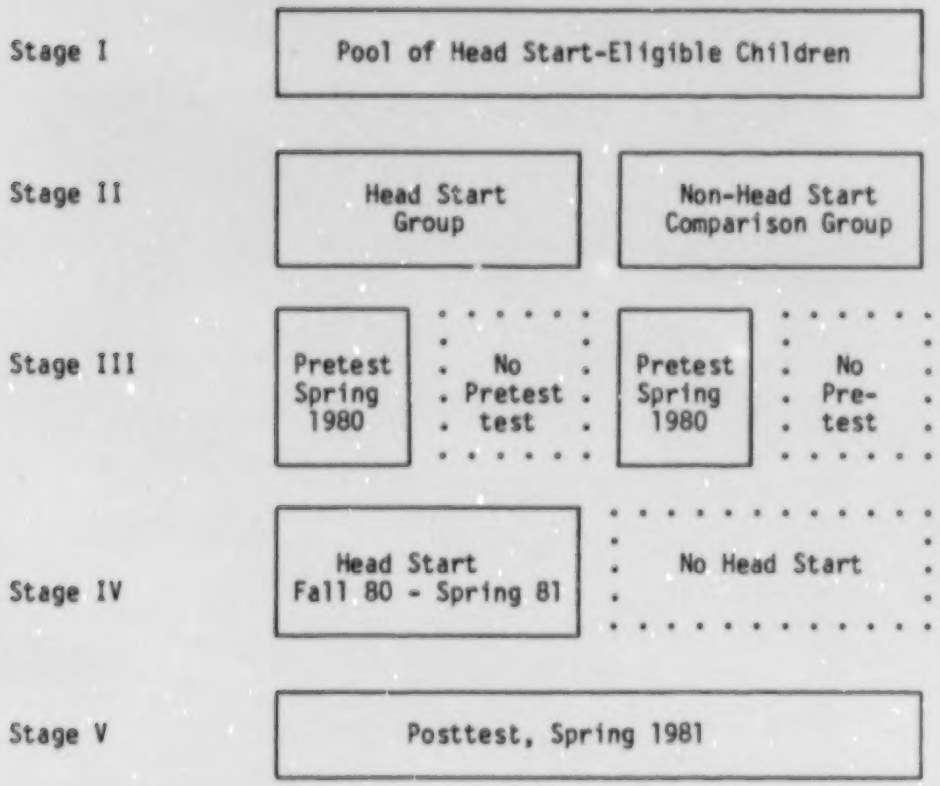
Design of the Head Start Health Evaluation

The Head Start Health Evaluation was designed to focus on the health status of Head Start children, within the context of previous findings, and to establish the linkages between the health status of Head Start participants and their participation in Head Start. The general design was to select a sample of Head Start programs (to collect extensive data on program operations) and, within each program, to administer a coordinated battery of health measures to a sample of participants. This approach, based on a sample of Head Start programs, required that Head Start participants be examined before and after their participation in Head Start to determine whether this participation had had an impact of their health status, and, if so, in what manner. Further, to guard against a variety of inappropriate inferences, it was essential to assess health status changes for a comparable group of non-participants from the same communities. Because changes in health status might be due to community health influences other than Head Start, the inclusion of the comparison group provided guards against incorrect attributions of impact. The overall design is illustrated in Exhibit A.

During Stage I of the evaluation (which began in winter 1980) a pool of low-income children was recruited in each site. This pool consisted of children who met the income and other requirements for Head Start participation. At Stage II (in late March 1980) the children were randomly assigned within same age and sex categories; one-half of the eligible children were randomly

Exhibit A

Evaluation Design and Implementation Stages
for Longitudinal Sample



assigned to enter Head Start the following fall, while the remaining children were assigned to the non-Head Start comparison group. Thus, treatment and comparison groups were comparable by design. Because the complete health examination undertaken in the pretest could possibly confound study results (that is, by giving all children a thorough preliminary examination, it was possible that subsequent referrals for health services based on the pretest assessments could mask the effects of later Head Start treatments),

not all children in the Head Start and comparison groups were permitted to participate in the pretest data collection. Hence, at Stage III, only half of the children in each group were assigned to be examined during the pretest (in the spring of 1980).

Splitting the sample in this manner complicated the study because it required almost twice as much analysis in order to ensure that results held for both the children who were pretested and those who were not. But such an approach acted to protect against a worst-case possibility. (As it turned out results for these two samples were practically identical. While this might suggest that it was unnecessary to split the sample at pretest, such an inference is unfounded. Had this not been done, a major threat to the validity of the study would have been untestable, thus leaving study findings open to doubt.)

At Stage IV of the evaluation (beginning in fall 1980) children assigned to the treatment group entered the Head Start program and participated in the program (during the 1980-81 program year). At the time of posttest data collection, these children had received Head Start services for approximately one program year (8-9 months).

During the posttest at Stage V (in spring 1981) the health status of all children in the study was assessed; that is, the pretested children in both the Head Start group and the non-Head Start comparison group were reassessed, and the remainder of the children in both groups, who had not been pretested the previous spring, were assessed for the first time.

Site Selection Considerations

The characteristics and number of sites to be included in the evaluation was the subject of lengthy discussions between the evaluation staff and the Administration for Children, Youth and Families. It was recognized that the use of a data collection team

of health specialists to collect health data (e.g., pediatricians for general pediatric health, pedodontists for dental health, and audiologists for hearing) would be costly and thus would limit the number of evaluation sites or result in very small samples of children in each of a larger number of sites. After much consideration of alternative strategies, available resources permitted implementation of the evaluation in four Head Start sites and examination of approximately 250 cnildren per site.

Several site and program characteristics were used to select the four sites:

- urban versus rural setting;
- region of the country;
- strength of local health care system and availability of free or subsidized health care for Head Start eligibles;
- ethnicity of the Head Start population,
- size of the Head Start program; and
- strength of Head Start health services locally.

The rationale for using this set of characteristics was as follows. On average, rural areas have fewer physicians and hospitals per capita. When combined with the greater distances that must be travelled in order to obtain services, access to health care is often substantially worse in rural rather than in urban sites. Since a substantial portion of Head Start programs serve rural areas, it was necessary to represent such sites in this evaluation.

Region of the county has a subtler influence. Although available health care services vary widely across regions, the variation within a region is also very great. Thus, although it was possible to obtain, within some regions, a sample representative of the range of health care services, it was preferable to select a balanced sample of sites across regions to improve the face validity of the sample used for the evaluation.

The strength of the local health care system and the availability of free or subsidized health care services for the poor vary widely across the nation. Some areas have large numbers of doctors and clinics, while others have few. In many areas, health services are so uneven that one or more vital services may not be available locally. (For example, one of the selected sites had no dentist within easy reach.) Further, although in some areas nearly all Head Start children were eligible for Medicaid, this was not universally the case and in one site, there was no Medicaid program. Since, when an alternative health delivery service is available, Head Start simply mediates the delivery of the needed health care, the absence of such alternatives within a community invariably increases the management and resource burden on the local Head Start program. A comprehensive examination of the Head Start health care system thus had to take account of this important local variation in health care resources.

During the program year, 1980-81, the Head Start children served were 42 percent black, 33 percent white, and 20 percent Hispanic. To reflect this distribution, two predominately black, one white, and one Hispanic site were appropriate, given a total of four sites.

In addition, the size of the Head Start program was an important site selection criteria. Given an initially estimated within-site sample size requirement to recruit 150 Head Start and 150 comparison children (to allow for attrition), only large Head Start programs, serving more than 300, were chosen for participation in the study. Further, to increase the probability of identifying Head Start impacts on the health status of low-income children, selection was also limited to Head Start programs with well-implemented health and nutrition programs that were in compliance with the Head Start Performance Standards for the health component. Thus, Head Start sites were excluded from consideration

if they were known to have weak health components. (While a process study examining Head Start services could be conducted in such sites, most of the major study issues could not be appropriately addressed.) No attempt, however, was made to identify Head Start programs with "model" health components. Instead sites were considered if the Head Start management information system, the Program Information Record (PIR), showed that the health program at that site was, by and large, operating competently and in a manner "typical" of that region. Thus, "typical" sites were selected, not so much to "represent" all Head Start programs but to evaluate standard health services delivery in the presence of the range of contextual factors which confront Head Start. Westinghouse Health Systems (the technical assistance contractor for the Head Start health services) and the U. S. Department of Health and Human Services regional offices also provided the assessments of the Head Start health services delivered in candidate sites for the Head Start Health Evaluation.

These criteria led to the selection of the following four sites:

- Greene County (Leakesville) and Humphreys County (Belzoni), Mississippi;
- St. Clair County (East St. Louis), Illinois;
- Maricopa County (Phoenix), Arizona; and
- Mingo County (Williamson), West Virginia.

The following site and program descriptions highlight the important features of each of the four sites. These characteristics are summarized in Exhibit B as well.

Exhibit B

Site, Health, and Head Start Program Characteristics of the Four Locations Chosen for the Head Start Health Evaluation

Characteristic	Greene & Humphreys Counties	St. Clair County	Maricopa County	Mingo County
Site Characteristics				
Degree of Urbanization of Largest Community	Rural	Urban	Urban	Rural
Department of Health and Human Services Region	4	5	9	3
Health Services Characteristics				
Number Physicians per 100,000	34/35[a]	77	199[b]	90
Number of Hospitals	1/2	6	29	1
Program Characteristics				
Funded Enrollment	613[c]	650	419	300
Total Actual Enrollment	620	899	458	345
Percent Children with Medicaid	38.9	68.2	0.0	27.1
Schedule: Days/Week	5	2 or 4[d]	4	4
Hours/Day	6.5	6	3.5 to 4	6
Number of Years Children Enrolled	Two to three years	Two to three years	One year (with one-year home-based program prior to center enrollment for some children)	Two years
Predominant Ethnicity of Children Enrolled	Black	Black	Hispanic	White

[a] Data for each county are presented separately: Greene/Humphreys.

[b] Many physicians and hospitals concentrated in areas of Maricopa County which are not accessed by families studied.

[c] Total funded enrollment for the grantee was 3700; total actual enrollment was 4278.

[d] Program operates four days/week. Some children only attend two days.

Greene and Humphreys. This "site" actually combined two rural counties in Mississippi with similar demographic and health service characteristics and served by the same Head Start grantee. Friends of Children, the Head Start grantee, was responsible for services to children in 11 counties, in addition to Greene and Humphreys, making it one of the largest Head Start programs in the country. Its total funded enrollment was 3700 children in the 1980-81 program year, of which 200 were enrolled in the programs in Greene County and 413 were enrolled in Humphreys County. With a schedule of five days per week and 6.5 hours per day, this program was the most intensive among those included in the Head Start Health Evaluation. Most of the children served by the program were black. They typically entered Head Start shortly after their third birthday and attended for two to three years prior to entering public school.

Delivery of health services to children in Greene and Humphreys counties was the most challenging in the evaluation. Lack of cooperation by the Welfare Department in the identification of EPSDT-eligible children meant that few of the required health services were Medicaid reimbursable. The skilled and dedicated management of the Head Start health component, in the face of such enormous local constraints, was evident and was an important factor in the delivery of health services.

St. Clair County. This site consisted of urban East St. Louis, Illinois and the surrounding more rural area. Although 1970 Census information showed high medical underservice in the county, during the succeeding decade many health care providers opened clinics in various parts of East St. Louis, even in the public housing projects, thereby vastly improving access to health care for low-income families. The Head Start grantee, the Economic Opportunity Commission, was funded to serve 650 children, 95 percent of whom lived in East St. Louis. The program operated on a four days per week schedule, but allowed the children to enroll for either a two-day or a four-day program of 6 hours per day. Turnover in enrollment was very high. Most of the Head Start children were black and some attended Head Start for two to three years prior to entry into public school.

In St. Clair County the Head Start program, on the recommendation of the Health Advisory Board, had taken a highly constructive approach to the delivery of

health services. Prior to entry into Head Start and as a part of the application process, the child's parent was responsible for having the child screened for medical and (more recently) dental problems. This was feasible since health care services were readily available to most of the families in East St. Louis, although those in other areas in St. Clair County were less well served. Head Start reviewed the results of those pre-entry health screens, assisted in follow-up as needed, usually during the summer before the child entered the program. Because almost all of the children served by Head Start were Medicaid-eligible, the program needed to spend very few of its resources on health care service.

Maricopa County. This site was located in the suburbs of Phoenix, Arizona. Although many families in this county are economically very well off, those who are low-income are frequently considerably below the average for Maricopa County. Some areas of Maricopa County, such as Phoenix and Scottsdale, have exceptionally high levels of medical service; but the evaluation focused on suburbs of Phoenix, primarily Mesa, Chandler, Glendale, El Mirage, and Surprise. At the time of the evaluation, Arizona had no Medicaid program. (A Medicaid program has been instituted subsequently, however.) Without this program, access to publicly-supported health services was particularly difficult for low-income families. Although many low-income families used the Maricopa County Department for health care, some of the communities studied did not have a primary care clinic. Of the three Head Start programs operating in Maricopa County; the evaluation focused on the program operated by the Maricopa County Community Services Department. This program was funded for 419 children during the 1980-81 school year. Most children participated only for one year prior to entry into kindergarten. However, a small group of approximately 88 children participated in a one-year home-based program prior to center enrollment. The center schedule was four days per week, and most centers ran two half-day programs of approximately 3.5 to 4 hours per day. The majority (68%) of the children in the Maricopa County Head Start program were Hispanic, another 20 percent were white, and the remainder were black, Native American, or Asian. Some of the children enrolled in this program were from families of undocumented workers. For them, enrollment in Head Start provided the only access they had to health care services, because their families were not eligible for publicly-supported health services.

In Maricopa County, health services were available from the Maricopa County Health Department through a contract between Head Start and that agency. Since health services were sometimes geographically remote, the Health Department used local satellite primary care clinics, or Head Start transported the children to the nearest clinic for medical services. Dental services were provided to Head Start children in a mobile trailer which was moved from center to center. Because there was no Medicaid in Arizona, Head Start's contract with the Health Department provided all health services to children through an arrangement similar to a health maintenance organization (HMO).

Mingo County. This site was located in the heart of the Appalachian mountains of West Virginia. It is very rural and relatively inaccessible. Many families in this county are supported by the coal mining industry. Although overall the ratio of physicians to members of the general population was above average, few health services were available outside of Williamson, the county seat. The Head Start program grantee, the Mingo County Economic Opportunity Commission, was funded to serve 300 children. Approximately 90 percent of those enrolled were white. Most children, enrolled in this program, participated for two years on a schedule of six hours per day, four days per week.

In Mingo County there were very few health services available and, because the Medicaid reimbursement for medical screens was so low, local physicians were reluctant to treat Head Start participants with Medicaid coverage. On the other hand, Medicaid-eligible children did receive dental services without similar difficulties.

A Comprehensive Management Review (CMR) of this program, conducted just prior to the posttest data collection, revealed that this program was out-of-compliance with the Head Start Performance Standards on 87 items, many of them pertaining to the delivery of health services. (CMR's of the other programs were much more positive.) Staffing changes during 1980-81 in the Head Start central office, including the health coordinator, greatly fragmented the health service delivery effort and the effectiveness of this program. Coupled with the on-going need to renegotiate constantly for provision of health services by local providers, the delivery of health services to children in this site was the most chaotic observed by the evaluation.

Samples of Children

As mentioned previously, the evaluation design specified recruitment of 300 children per site and an optimistically low attrition rate of approximately 16.7 percent (50 out of 300 children) over the approximately 16 months between recruitment and posttest. The actual attrition rates of the children from the sample vastly exceeded the prior estimates.

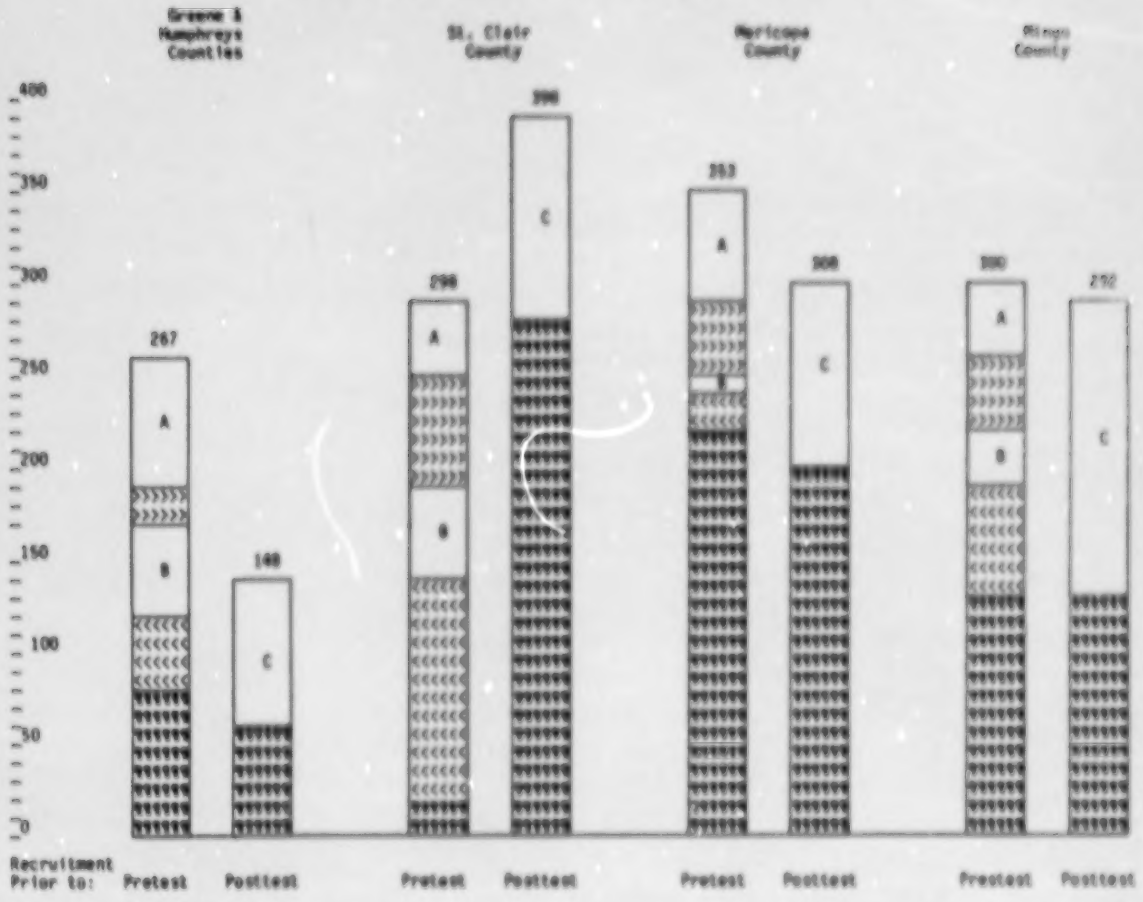
The experience of the evaluation vis-a-vis a Head Start-eligible population of children is shown in Exhibit C. This experience is instructive and reflects each of the Head Start program's own experience with recruitment and turnover among their eligible population: Greene and Humphreys Counties generally experienced the lowest rates of attrition and turnover while St. Clair County experienced a very high rate of attrition from the program. (Although the attrition rate in Maricopa County was very high among the children recruited for the evaluation, the Head Start program's added requirement that the family provide transportation for their child greatly delimited the children who participated in the program and reduced the numbers of children lost to attrition.) Hence the evaluation team's difficulties in retaining the families who had initially agreed to participate in the Head Start Health Evaluation was very similar to that of the Head Start program in each site with respect to recruitment and attendance of the children in the program.

As shown in Exhibit C, 1218 children were recruited for the Head Start Health Evaluation between January and March 1980, prior to the pretest. However, of those rostered, nearly 38 percent were lost to attrition without a family background interview or health examination.

The pretest recruitment, therefore, produced the following results. Sample recruitment goals, although nearly met in all of

Exhibit C

Number of Children Recruited for the Head Start Health Evaluation and the Proportions Evaluated Versus Lost by Attrition



Key to Samples:

A	Initial recruitment sample: received both pretest and posttest (longitudinal sample).
B	Initial recruitment sample: received posttest only.
C	Augmentation sample recruited prior to posttest: received posttest only.
>>> D >>>	Initial recruitment/attrition sample: received pretest only.
<<< E <<<	Initial recruitment/attrition sample: received neither pretest nor posttest.
999999999	Rostered and signed consent to participate only, never completed the family background questionnaire.

the sites, produced fewer than desired children with sufficient family and health information needed for the evaluation. At the time of the pretest data collection in April 1980, those children with at least a completed family background questionnaire numbered 277 in St. Clair County, 180 in Greene and Humphreys Counties, 170 in Mingo County, and only 130 in Maricopa County. This shortfall, coupled with expected additional sample attrition, meant that the recruitment period had to extend beyond the pretest in order to ensure adequate sample sizes for posttest data collection. Recruitment for the augmentation sample occurred in Stage IV of the evaluation (see Exhibit A).

Such modifications in the samples of children ultimately required five classifications of children to distinguish among those who remained in the study, those who dropped out, and those who were added after the pretest. These have been defined as separate samples of children in this report. Exhibit D shows the samples of children for each of the sites in the Head Start Health Evaluation who had sufficient information to analyze in one or more parts of the evaluation. The column percentages indicate, within each site, the contribution of each sample (from A to E) to the total sample size. This exhibit also demonstrates that rates of attrition among families who only participated in a part of the evaluation (Samples D and E) varied considerably among the sites: 50 percent in St. Clair County, 31 percent in Mingo County, 27 percent in Maricopa County, and 18 percent in Greene and Humphreys Counties. In all sites except St. Clair County, Sample C amply replaced the children lost from the study through attrition.

Because of the substantial changes in the original sample from attrition and augmentation, the evaluation conducted an extensive investigation of the possible implications of these sample

Exhibit D

Number of Children in Evaluation by Sample and Site

Sample		Greene & Humphreys Counties	St. Clair County	Maricopa County	Mingo County	All Sites
A	n	74	42	56	36	208
	%	26.6	10.8	24.3	10.9	17.0
B	n	56	41	11	31	139
	%	20.1	10.6	4.8	9.4	11.3
C	n	98	111	100	161	470
	%	35.3	28.6	43.5	48.6	38.3
D	n	21	71	39	37	168
	%	7.6	18.3	17.0	11.2	13.7
E	n	29	123	24	66	242
	%	10.4	31.7	10.4	19.9	19.7
TOTAL		278	388	230	331	1227

A. Initial recruitment sample: received both pretest and posttest (longitudinal sample).

B. Initial recruitment sample: received posttest only.

C. Augmentation sample recruited prior to posttest: received posstest only.

D. Initial recruitment/attrition sample: received pretest only.

E. Initial recruitment/attrition sample: received neither pretest nor posttest.

changes. These investigations occurred at two points in time, in the fall after the Head Start children entered the program and after the posttest data collection as part of the analysis. In general, the first investigation indicated that minor differences existed

between the Head Start and non-Head Start samples, but none were statistically significant. The more intensive investigation after the posttest produced a similar result; no consistent statistically significant differences among the samples (A, B, C vs. D, E) in either their health or personal characteristics. (The characteristics of the children who were only rostered was unknown and could not be examined further.)

Health Measures

Other design questions concerned the focus of the health measurement battery. Some of the basic questions included: What measures were required to assess Head Start program achievements due to the Performance Standards? What extant reliable measures were available? Would these measures provide comparable health indicators to prior studies and evidence of Head Start's impacts on children's health?

Since the evaluation was to assess Head Start in light of the Performance Standards, measures were selected to cover the full range of health services mandated by these standards (see Exhibit E). In general, these health measures consisted of a series of examinations and observations of the child conducted by health professionals and paraprofessionals, and several parent interviews to fill out the child and family's health history. The following battery of health examinations was chosen:

- pediatric evaluation;
- dental evaluation;
- anthropometric evaluation;
- hematology evaluation;
- developmental evaluation;
- speech and language evaluation;

Exhibit E

Health Services Mandated by Head Start Performance Standards

Health Services
Health history, including: Copy of immunization record Health screens, including: Growth assessment (height, weight, age), Vision testing (for visual acuity and strabismus), Hearing testing, Hemoglobin and hematocrit level; Tuberculin testing where indicated, Selected additional screens: sickle cell anemia, intestinal parasites, and lead poisoning, Determination of immunization status, Identification of speech problems; Identification of special needs of handicapped children Medical examination of: All systems or regions suspect by history or health screen Specific regions commonly important in age group (skin, eyes, nose, throat, heart, lungs, groin) Medical treatment of: All health problems detected Completion of recommended immunizations against seven diseases Dental examination and basic services including: Relief of pain or infection Restoration of decayed primary and permanent teeth Pulp therapy for primary and permanent teeth, as necessary Extraction of non-restorable teeth Dental prophylaxis and instruction in self-care oral hygiene procedures Application of topical fluoride in unfluoridated communities Health education, including: Provision of information to parents of all available health resources Encouragement of parents to become involved in health care process Integration of health education into ongoing program activities Familiarization of children with all health services they will receive prior to delivery of services Nutrition services including: Nutrition assessment Meals and snacks

- vision evaluation;
- hearing evaluation; and
- nutritional observation.

In addition to these child evaluations, a parent interview would consist of three major parts:

- health history of child;
- nutritional evaluation of child; and
- family background.

There were some extant measures to consider. Although the Head Start Health evaluation was one of the first longitudinal assessments of the impacts of health intervention programs on the health status of low-income children, the experiences of other health researchers in such previous major cross-sectional surveys of children's health status as the First National Health and Nutrition Examination Survey, the Preschool Nutrition Survey, and the Ten-State Nutrition Survey provided guidance. Exhibit F compares some of the characteristics of the Head Start Health Evaluation with these prior surveys.

Although these prior cross-sectional studies proved to be quite useful in designing the current effort, great care had to be exercised in applying the lessons of this previous research to the present evaluation. Because this evaluation was longitudinal rather than cross-sectional in design and because it focused on a single treatment, Head Start, it differed markedly from all prior research in this area. The contribution of these prior studies to the design of the present evaluation was therefore greatest in the area of cross-sectional measurement selection and in the choice of standard methods of analyzing and reporting health-related information. In addition, the prior data were particularly useful as

Exhibit F

Characteristics of Four Surveys of the Health Status of Low-Income Children

Survey Characteristic	Preschool Nutrition Survey	Ten-State Nutrition Survey	First National Health & Nutrition Examination Survey	Head Start Health Evaluation
Sample Size: Children below age 6	3441	3700	1500	1227
Ethnic Distribution (Percent):				
White	80	43	66	35
Black	14	40	34	57
Hispanic	5	17		12
Other	1	1		2
Geographic Distribution	36 states + D.C.	10 states	100 sites	4 sites
Survey Dates	Nov. 1968-Dec. 1970	May 1968-May 1970	1971-1974	April 1980-April 1981
Income Distribution	33% had incomes > 3x (poverty level)	5% had incomes > 3x (poverty level)	random with poor over-sampled	all below poverty level
Objective	Describe nutritional status of preschool children	Ascertain incidence and location of malnutrition	Establish national nutrition surveillance system	Establish health status and estimate Head Start impacts

sources of reference data for comparison with these low-income children's health and nutritional status.

The health measures used in the Head Start Health Evaluation also had to permit attribution of changes in health status over the course of a year to the intervention of the Head Start program. The selection and development of the appropriate measures was complex in that many of the measures useful for a cross-sectional analysis, that is, useful in determining health status, are of limited utility in examining longitudinal changes in this status.

One of the important problems in this regard was measuring degrees of "wellness". For a large number of health domains it is only possible to quantify degrees of disease, the absence of disease being designated as the state of being "well". There are often no degrees of "wellness". Thus, we would generally expect to see no change over the program year in children originally classified as "well". For example, children with good hearing or vision should not be expected to hear or see "better" after a year in Head Start. Consequently, if change was to be measured it generally had to be sought in improvements measured in that segment of the population for which a health problem was identified. Because the number of children afflicted with any given condition is generally small, statistical analysis was consequently more difficult.

After consideration of these design issues, the evaluation selected and developed the following battery of evaluation measures.

Pediatric Evaluation. This evaluation, administered by a pediatrician, assessed the child's general health condition in conjunction with a detailed health history (described below). Since no extant examination instrument proved completely acceptable, the final instrument was developed by selecting and modifying items from three sources: the Rochester Child Health Study, the First National Health and Nutrition Examination Survey, and the physical examination form used in the Medical Diagnostic Clinic of Children's Hospital in Boston.

The pediatric examination instrument contained nineteen separate sections, each for a different body area or system, and was used to record and describe any abnormal findings. The examination contained items pertaining to the head, eyes, nose, throat and ears, including the eardrum and auditory canal, auscultation of the lungs, abdominal and kidney evaluation, evaluation of heart sounds, joint movements, and reflexes. Blood pressure was also recorded.

Dental Evaluation. This evaluation, in conjunction with a dental history (described below), was administered by a pedodontist. The dental examination included an assessment of a variety of aspects of dental health. The number and location of decayed and filled surfaces and missing teeth provided a measure of the prevalence and incidence of dental caries, the treatment needs of the children studied, and the results of dental services. A periodontal inspection assessed inflammation of the gingiva or soft gum tissues. The degree of plaque was measured using an oral hygiene index developed for the evaluation. A classification of the occlusion, or the relationship of the upper and lower teeth, and an index of open bite were also recorded. The dental evaluation concluded with a clinical judgment of the child's dental health status. Findings included abnormal caries, inflammation, premature loss of permanent teeth, and presence of nonvital teeth.

Anthropometric Evaluation. This evaluation was structured to be administered by a paraprofessional trained to follow a specific protocol for collecting reliable anthropometric information. The measures chosen were considered standard for determining growth status including height, weight, arm circumference, and triceps skinfold thickness.

Hematologic Evaluation. This evaluation was based on assays of blood samples collected from children during the health evaluations. Blood samples were collected by laboratory technologists accustomed to performing venipunctures on children. The assays performed included hematocrit, hemoglobin, free erythrocyte protoporphyrin, total iron binding capacity, serum iron, transferrin saturation, ferritin, cholesterol, vitamin C, vitamin A, and B-carotene.

Developmental Evaluation. The developmental evaluation, like the anthropometric evaluation, was designed for administration by a paraprofessional trained to follow a specific protocol. The Motor Scale of the McCarthy Scales of Children's Abilities was used. The McCarthy Motor Scale

contains items that assess the fine and gross motor development of the child--for example, the ability to draw a circle or stand on one foot--abilities considered to be related to the physical health of children. According to the reviews of this instrument in Buros (1978, pp. 309-314), this battery was better suited to the detection of developmental disabilities than other tests. Furthermore, a study by Kaufman and Kaufman (1973) provided evidence that the McCarthy scales were comparatively less sensitive to black-white differences in children below 6 years of age.

The other developmental measures employed were assessments of the child's behavior according to parental report. These assessments of the child's behavior were based on parents' responses about the frequency of 29 commonly occurring behaviors. These behaviors were scaled to describe the extent to which the child appears overly aggressive or withdrawn.

Speech and Language Evaluation. This battery was administered by speech pathologists. The evaluation included screening for both speech and language problems. The battery included several speech evaluation measures The Denver Articulation Screening Examination by Drumwright (1973) was used to assess the children's articulation and a portion of the Physician's Developmental Quick Screen for Speech Disorders assessed other speech characteristics, including intelligibility, voice quality, typical pitch, and typical volume.

Another portion of the battery assessed both receptive and productive language problems. The language comprehension instrument, the Assessment of Children's Language Comprehension (ACLC by Foster, Gidden, and Stark, 1973), assessed language comprehension and consisted of four subsections which measured the child's ability to process an increasing number of syntactic units. Each child was shown a picture and presented with a stimulus word, the child then pointed to the appropriate stimulus object in the picture. Another section of the speech and language evaluation measured verbal expression by using the sentence repetition component of the Fluharty Language Screening Test for Preschool Children. The child repeated the stimulus sentence produced by the speech pathologist and received a score for each sentence repeated accurately.

Vision Evaluation. The vision evaluation, administered by an optometrist, was intended to detect the presence of actual or potential vision system impairment in each child. It consisted of a set of components designed to examine the following vision functions: oculomotility, strabismus, convergence, retinoscopy, visual acuity, stereo acuity, binocular function, and color differentiation. In addition, the eyes were examined, both externally and internally, to determine the presence or absence of eye damage, lens or nerve damage, encrusted eyes, or other physical eye disorders. The parent of each child was also interviewed to determine awareness and understanding of any visual difficulties of the child.

Hearing Evaluation. The purpose of the evaluation was to determine hearing impairments in one or both ears, secondary to chronic or recurrent otitis media. Designed to be administered by an audiologist accustomed to testing preschool children, it included pure tone audiometry and impedance tympanometry. The audiometry tests for hearing loss in each ear were conducted at 500, 1000, 2000, and 4000 Hz. In addition, the tympanometry measured middle-ear impedance and was used to detect occlusion or other pathologies associated with the middle ear. In general, this evaluation provided information on both hearing loss from conductive and sensorineural problems.

Family Background Interview. This interview was designed to obtain baseline data on the family and child at the outset of the Head Start Health Evaluation and, also, data on any changes which took place between pretest and post-test. At each site an evaluation assistant administered the interview to parents or primary caretakers of each Head Start and non-Head Start child. The interview obtained demographic information about family size (number of household members--adults and children), marital status, access to services, education of adults, mobility of the household, insurance coverage, income, employment status, ethnicity, and language used. This interview also examined the parent's impressions of the child's behavior and, for Head Start children, the parent's knowledge of services provided to their child.

Health History. A medical, dental, and vision history of the child was administered to each child's parent at the time of the health evaluation and was intended to provide important health information to aid in the evaluation of

the child's health status. The medical health history was developed from a variety of sources, including the Rochester Child Health Study, the Health Interview Survey (National Center for Health Statistics), and the medical history intake form from the Medical Diagnostic Clinic of Children's Hospital Medical Center in Boston. Items were modified to meet the requirements of the evaluation of health services and the evaluation's longitudinal design. This portion of the history included prenatal and childhood health, illnesses and infections, evidence of exposure to tuberculosis or intake of lead, incidence of accidents and injuries of the child, hospitalizations, records of immunizations and access to and utilization of medical services.

The dental portion of the health history focused on dental care, oral hygiene habits, dental service utilization, and access to flouride. The health history also included a vision history which focused on evidence of vision problems that could be observed by the parent (such as the child's complaining of headaches or burning eyes), prior prescriptions for glasses, or vision therapy for the child, and utilization of other vision services (such as a vision examination).

Dietary and Nutritional Habits Interview. This parent interview was designed to be administered by a nutritionist and contained two parts: a 24-hour dietary intake, and a 3-month food frequency covering the child as well as the nutrition habits of the family. The 24-hour recall and food frequency was adapted from the First National Health and Nutrition Examination Survey protocol.

The primary purpose of the interview was to examine in more depth the child's dietary practices, the family dietary practices, the family's food preparation practices, the parent's knowledge of nutrition, the family's participation in food subsidy programs (such as Food Stamps and WIC), and evidence of any Head Start impact on the eating habits of the child. The information collected from this parent interview provided evidence of the family knowledge, attitudes, and behaviors related to good nutritional practices.

Nutrition observation. Used only at the posttest on the Head Start children, this instrument was designed to be administered by a nutritionist or person trained in collecting food data in accurate portion sizes. A dietary

interview (described below), including a 24-hour recall of the child's consumption, was part of the evaluation battery. Since Head Start parents could not reliably report their child's consumption while in center care, an observation of this portion of the child's day was designed. This instrument included records of the child's intake of foods consumed during meals and snacks at the Head Start center.

General Analytic Methodology

Because the measures collected to address the research questions varied tremendously in type, form and purpose, the analyses of these data have drawn on a variety of statistical techniques. These techniques are summarized in Exhibit G.

The analysis of the pretest data was primarily descriptive and aimed at providing an assessment of the health status of children in terms of their health characteristics and particularly, the types of health deficiencies with which these Head Start-eligible and low-income children confront the Head Start health services delivery system. Since preliminary analyses demonstrated that both the randomly assigned groups of low-come children (those who would enter Head Start in the fall of the 1980 and those who would not participate in the program during the 1980-81 program year) were essentially equivalent, analyses and data presentation of the pretest data reflect the combination of both groups of children. Simple, overall descriptions of the health status of the children were not sufficient. The dramatic variations from one site to another in health services available to low-income children and the consequent health status of the children made it necessary to pay careful attention to the pretest results in each site, as well as across all four sites.

Moreover, although there was considerable similarity in the apparent quality of the health services delivery system for each

Exhibit G

Summary of Major Statistical Techniques by Domain of Analysis

Domain of Analysis	Statistical Technique
Attrition	Contingency tables and analysis of variance
Pediatric	Contingency tables
Dental	Contingency tables and Poisson models
Anthropometry	Contingency tables, smoothing, regression, and analysis of covariance
Diet/Nutrition	Contingency tables, regression, and analysis of covariance
Hematology	Contingency tables, regression, and analysis of covariance
Developmental	Contingency tables, regression, and analysis of covariance
Speech	Contingency tables, regression, and analysis of covariance
Vision	Contingency tables, regression analysis, and discrete multivariate analysis
Hearing	Contingency tables and regression, and analysis of covariance

of the programs according to the estimates available in the management information Program Information Records (PIR's), there was considerable variability in the actual circumstances each program confronted in delivery of health services to the Head Start

children. Considerably more in-depth information on the actual content of the children's health records was required to assess the delivery of health services in each of the sites. Again, the variation from site-to-site required paying attention to each program's service delivery, as well as to the pattern of delivery across all four sites to understand the potential impacts of the delivery of health services.

The analysis of the posttest data also focused particularly on comparisons between the experiences of the Head Start and non-Head Start children during the 1980-81 program year. Parent reports on both groups of children provided wide-ranging information on both the need for health services and the receipt of those services during the previous year. In many cases, the Head Start health records provided more detailed information on the services received by the Head Start children than the mother's of these children provided. In addition, for each of the children in the longitudinal sample, each health problem which had been identified at pretest and communicated to the child's local health provider (and to the Head Start program for the Head Start children) was specifically followed up at posttest for evidence of treatment and/or medical management. Some of the most detailed analyses conducted during the evaluation, focused on this information.

Using the posttest data, extensive analyses were conducted to assess the apparent impacts of the Head Start health services delivery system on the health status of children by direct comparisons of the Head Start and non-Head Start groups. These analyses also adjusted for any apparent non-equivalences between groups were feasible. Analyses focused on the longitudinal sample of 208 children identified a few Head Start impacts. Similar analyses of the entire posttest sample of 817 children (which had somewhat more power to detect small effects) produced slightly more evidence of the some of the impacts of the health services where those health services were delivered. Extensive examination of various types of "at risk" children provided little more insight.

APPENDIX II

REFERENCE GUIDE TO LOCATION OF FINDINGS
IN HEAD START HEALTH EVALUATION REPORT

Page Number in Executive Summary	Topic in Chapter Two	Source of Information in Final Report	Page Number in Final Report
	Question One		
9	Accidents	Exhibit 3-8	3-15
	Perinatal Health		
9	Children	Exhibit 3-7	3-14
9	Mother's	Exhibit 3-6	3-14
9	Mother's Age	Table 3A-10	3A-11
	Pediatric Health		
9	Any Problem	Exhibit 3-4	3-12
10	Specific Problem	Exhibit 3-2	3-9
	Dental		
10	Affected Surfaces	Exhibit 4-3	4-10
10	Urgent Care	Exhibit 4-6	4-12
10	Nutrition	Exhibit 6-4	6-18
10	Motor Development	Exhibit 8-3b	8-12
	Speech and Language		
10	Any Problem	Exhibit 9-2	9-8
10	Articulation Delay	Exhibit 9-3	9-10
10	Vision	Exhibit 10-2	10-5
11	Hearing	Exhibit 11-2	11-5
	Question Two		
	Medical		
11	Examinations	Exhibit 2-6	2-31
11	Treatment	Exhibit 2-6	2-31

Page Number in Executive Summary	Topic in Chapter Two	Source of Information in Final Report	Page Number in Final Report
	Dental		
11	Examinations	Exhibit 2-6	2-31
11	Treatment	Exhibit 2-6	2-31
11	One Site: Decay	Exhibit 4-12	4-23
11	One Site: Increase	Exhibit 4-11	4-22
11	One Site: Fillings	Exhibit 4-10	4-20
	Nutrition		
12	Intakes Head Start	Exhibit 6-13	6-38
12	Intakes Non-Head Start	Exhibit 6-27	6-62
12	Food Assistance	Exhibit 6-20	6-51
12	Meals at Home	Exhibit 6-38	6-84
12	Nutritional Assessment	Exhibit 7-9	7-23
12	Blood Tests	Exhibit 7-9	7-23
	Immunizations		
12	Total	Exhibit 3-10	3-17
12	By Head Start	Exhibit 3-12	3-21
12	Development Assessment	Exhibit 8-5	8-15
13	Speech and Language	Exhibit 9-4	9-11
13	Vision Screen	Exhibit 10-3	10-8
13	Hearing Screen	Exhibit 11-3	11-7
	Parent Involvement		
13	Visited Classroom	Exhibit 6-14	6-40
13	Visited Once/Week	Exhibit 6-15	6-41
13	Food and Nutrition Meeting	Exhibit 6-14	6-40

Page Number in Executive Summary	Topic in Chapter Two	Source of Information in Final Report	Page Number in Final Report
	Health Records &		
I3	Reports	Exhibit 2-6	2-31
	Question Three		
I3	Medical Examination	Exhibit 3-18	3-30
	Other Preventive		
I4	Health Services	Exhibit 3-19	3-31
	Treatment of Prob-		
I4	lems Found	Table 3A-16	3A-21
	Problems at Post-		
I4	test	Table 3A-14	3A-15
	Single & Multiple		
I4	Problems	Table 3A-17	3A-22
	Dental Examination		
I4	Head Start	Exhibit 4-8	4-16
I4	Non-Head Start	Exhibit 4-9	4-18
I4	Fillings	Exhibit 4-14	4-25
I4	Dental Visits	Exhibit 4-18	4-30
	Nutrition		4-31
I5	Meals at Home	Exhibit 6-38	6-84
	Head Start Present		
I5	vs. Absent	Exhibit 6-25	6-58
	vs. Non-Head		
I5	Start	Exhibit 6-26	6-59
	Speech Evaluation		
I5	Head Start	Exhibit 9-4	9-11
I5	Non-Head Start	Exhibit 9-7	9-15
	Vision Screen		
I5	Head Start	Exhibit 10-3	10-8
I5	Non-Head Start	Exhibit 10-6	10-14

Page Number in Executive Summary	Topic in Chapter Two	Source of Information in Final Report	Page Number in Final Report
	Question Four		
	Pediatric Evaluation		
15	Problem at Post-test	Table 3A-14	3A-15
16	Treatment of Problems Found	Table 3A-16	3A-21
	Dental Evaluation		
16	Head Start	Exhibit 4-8	4-16
16	Fillings	Exhibit 4-10	4-20
16	Dental Hygiene	Exhibit 4-15	4-26
16	Prevalence of Cavities	Exhibit 4-11	4-22
16	Anthropometry	Exhibit 5-8	5-14
	Nutrition		
16	Cross-Sectional	Exhibit 6-24	6-57
16	Longitudinal	Exhibit 6-16	6-44
17	Head Start Present vs. Absent	Exhibit 6-16	6-46
17	vs. Non-Head Start	Exhibit 6-16	6-46
17	Food Assistance	Exhibit 6-19	6-49
	Biochemical Evaluation		
17	B-carotene	Exhibit 7-8	7-22
17	Vitamin C	Exhibit 7-11	7-27
17	Abnormal Hgb or Hct	Exhibit 7-10	7-25
17	All Measures	Exhibit 7-11	7-27
	Developmental Evaluation		
17	No Problems	Exhibit 8-7	8-21
17	Longitudinal	Exhibit 8-6	8-17

Page Number in Executive Summary	Topic in Chapter Two	Source of Information in Final Report	Page Number in Final Report
	Speech and Language Evaluation Deficiencies at		
18	Posttest	Exhibit 9-9	9-10
18	One Site	Exhibit 9-10	9-19
18	Vision Evaluation	Exhibit 10-4	10-10
18	Hearing Evaluation	Exhibit 11-5	11-11

Page Number in Executive Summary	Topic in Chapter Three	Source of Information in Final Report	Page Number in Final Report
	Pediatric Evaluation		
	Pediatric Health		
19	Any Problem	Exhibit 3-4	3-12
19	Specific Problem	Exhibit 3-2	3-9
	Perinatal Health		
20	Mother's	Exhibit 3-6	3-14
20	Mother's Age	Table 3-10	3A-11
	Medical Services		
20	Examination	Exhibit 3-10	3-17
20	Immunization	Exhibit 3-10	3-17
20	TB Test	Exhibit 3-12	3-21
20	Lead Test	Exhibit 3-12	3-21
20	Problems at Post-test	Table 3A-14	3A-15
21	Treatment	Exhibit 3-20	3-32
21	Other Preventive Health Services	Exhibit 3-19	3-31
	Dental Evaluation		
	Comparison to		
21	Prior Surveys	Exhibit 4-7	4-14
21	Pretest Procedures	Exhibit 4-3	4-10
21	Dental Services	Exhibit 4-8	4-16
	Impacts		
22	Incidence	Exhibit 4-10	4-20
22	Prevalence	Exhibit 4-11	4-22
22	Brush Teeth	Exhibit 4-18	4-30, 1
22	Hygiene Practices	Exhibit 4-15	4-26

Page Number in Executive Summary	Topic in Chapter Three	Source of Information in Final Report	Page Number in Final Report
	Anthropometric Evaluation		
	Pretest		
22	Percentiles	Exhibit 5-3	5-8
	Posttest		
22	Percentiles	Exhibit 5-9	5-15
	Below 10th		
23	Percentile	Exhibit 5-10	5-17
	Nutrition Education		
	Pretest & Prior		
23	Surveys	Exhibit 6-5	6-20
	Problematic		
23	Nutrients	Exhibit 6-4	6-18
	Head Start Present		
24	vs. Absent	Exhibit 6-25	6-58
	vs. Non-Head		
24	Start	Exhibit 6-24	6-57
24	Marginal Intakes	Exhibit 6-22	6-53
24		Exhibit 6-23	6-54
24	Longitudinal Impact	Exhibit 6-16	6-44
24	Less than 100% RDA	Exhibit 6-17	6-46
25	Head Start Meals	Exhibit 6-13	6-38
25	vs. Absent	Exhibit 6-25	6-58
	vs. Non-Head		
25	Start	Exhibit 6-24	6-57
25	Food Assistance	Exhibit 6-20	6-51
25	Parent Education	Exhibit 6-14	6-40
25	At-Home Diet	Exhibit 6-38	6-84

Page Number in Executive Summary	Topic in Chapter Three	Source of Information in Final Report	Page Number in Final Report
	Biochemical Evaluation		
26	Prior Surveys	Exhibit 7-8	7-22
26	Hematologic Screen	Exhibit 7-9	7-23
26	Abnormal Levels	Exhibit 7-10	7-25
26	WIC/Food Stamps	Exhibit 7-13	7-30,2
26	Biochemical Indicators	Exhibit 7-11	7-27
	Developmental Evaluation		
27	Pretest Results	Exhibit 8-4	8-14
27	Developmental Screen	Exhibit 8-5	8-15
27	Developmental Services	Exhibit 8-5	8-15
	Impacts on Children		
27	Below Average	Exhibit 8-6	8-17
27	Longitudinal	Table 8-9	8A-12
	Speech and Language Evaluation		
28	Pretest	Exhibit 9-2	9-8
28	Articulation Delays	Exhibit 9-3	9-10
28	Speech Screen	Exhibit 9-4	9-11
28	Speech Services	Exhibit 9-6	9-14
28	Impacts	Table 9A-13	---

Page Number in Executive Summary	Topic in Chapter Three	Source of Information in Final Report	Page Number in Final Report
	Vision Evaluation		
29	Pretest Prevalence	Exhibit 10-1	10-5
29	Vision Screening	Exhibit 10-6	10-14
29	Vision Problems	Exhibit 10-5	10-12
29	Vision Services	Exhibit 10-4	10-10
29		Exhibit 10-6	10-14
	Hearing Evaluation		
29	Postiest Prevalence	Table 3-19	3A-24
29	Pretest Prevalence	Exhibit 11-2	11-5
29	Hearing Screen	Exhibit 11-3	11-7
30	Hearing Status	Exhibit 11-4	11-9

APPENDIX III

ACKNOWLEDGEMENTS

This six-year evaluation is the accumulated achievement of numerous persons and groups. Without the cooperation, patience, and assistance of all, we never could have completed the study. Several of these deserve special recognition for their contributions to the evaluation effort.

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John Graef	Jose Santos	Patricia Whitley

Pedodontists

Gary Lindner	Andrew Sonis
David Meadows	Adel Tawadros

Timothy Wright

Optometrists

Stephanie Johnson
Wilburn Lord

Speech Therapists

Gwen Chambliss	Judy Meyer
Sharon Hendrickson	Sonia Pomotowski
Karen Hurst	Janice Tucker
Betty McCoy	Patricia Wise

Audiologists

Julie Hauser	Cynthia Mauro
Kathe Kurmin	Lavonne Millisits

Diane Sabo

Medical Technologists

Zelda Anderson	Beth McMains
Linda Boggs	Dorothy Million
Cynthia Kelly	Kathy Nielson

Nutritionists

Raul Alejandro	Lyn Konstant	Fran Rohr
Nan Allison	Lilianne L'Heureux	Sandra Seiler
Irene Berman	Grace Lloyd	Nancy Sheard
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Chapter 1: Linda B. Fosburg, Ph.D.

Chapter 2: Linda B. Fosburg, Ph.D.

Appendices: (A) Linda B. Fosburg, Ph.D.
(B) David C. Hoaglin, Ph.D.
(C) Linda B. Fosburg, Ph.D.

Chapter 3: Linda B. Fosburg, Ph.D., John H. Himes, Ph.D., and Michael Weitzman, M.D.

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